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1 SEM TDC STS M 1 (N/O)

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(November)

STATISTICS

(Major)

Course : 101

(**Descriptive Statistics**)

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

(New Course)

Full Marks : 80

Pass Marks : 24

1. Choose the correct answer : 1×8=8

(a) Statistics deals with

(i) qualitative information

(ii) quantitative information

(iii) Both (i) and (ii)

(iv) None of the above

(b) Ogives for more than type and less than type distributions intersect at

(i) mean

(ii) median

(iii) mode

(iv) origin

(c) If the grouped data has open-end classes, one cannot calculate

(i) median

(ii) mode

(iii) mean

(iv) quartiles

(d) The standard deviation of a set of values will be

(i) positive when the values are positive only

(ii) positive when the values are negative only

(iii) always positive

(iv) All of the above

(e) If a moderately skewed distribution has mean 40 and median 30, the mode of the distribution is

(i) 10

(ii) 35

(iii) 20

(iv) 0

(f) The range of simple correlation coefficient is

(i) 0 to ∞

(ii) $-\infty$ to ∞

(iii) 0 to 1

(iv) -1 to +1

(g) If $\rho = 0$, the lines of regression are

(i) coincident

(ii) parallel

(iii) perpendicular to each other

(iv) None of the above

(h) In case of three attributes A, B and C, the class frequency (abc) in terms of other class frequencies is

(i) $(AB) + (AC) - (B) - (ABC)$

(ii) $(ABC) - (B) + (AB) - (BC)$

(iii) $(ABC) - (A) - (C) + (B)$

(iv) $(B) - (AB) - (BC) + (ABC)$

2. (a) Distinguish between the following : $2+2=4$
(i) Quantitative data and Qualitative data
(ii) Discrete data and Continuous data
- (b) Discuss the limitations of Statistics. 4
3. (a) Explain various types of measurement scale with suitable examples. 6

Or

- (b) How do you define chart, diagram and graph? What are the advantages of charts, diagrams and graphs? $2+4=6$
4. Explain the important properties of arithmetic mean. 3
5. Answer any *three* of the following : $8 \times 3 = 24$

- (a) What are AM, GM and HM? A variate takes values $1, r, r^2, \dots, r^{n-1}$ each with frequency unity. Show that

$$AM = \frac{1-r^n}{n(1-r)}, \quad GM = r^{\left(\frac{n-1}{2}\right)}$$

$$\text{and } HM = \frac{n(1-r)r^{(n-1)}}{1-r^n}$$

Also verify that $AM : HM = GM^2$. $3+3+2=8$

(b) What is standard deviation? Explain its superiority over other measures of dispersion. Show that for any distribution the standard deviation is not less than the mean deviation from the mean. 2+2+4=8

(c) Define raw moments and central moments. Establish the relationship between moments about mean in terms of moments about any arbitrary point. 8

(d) What do you understand by skewness? Explain its different types. The first three moments about the origin are given by

$$\mu'_1 = \frac{n+1}{2}, \quad \mu'_2 = \frac{(n+1)(2n+1)}{6}$$

$$\text{and } \mu'_3 = \frac{n(n+1)^2}{4}$$

Examine the skewness of the data.

2+2+4=8

6. (a) How can you use scatter diagram to obtain an idea of the extent and nature of correlation coefficient? 3

(b) Obtain the normal equations for fitting the curve $y = ab^x$. 3

7. Answer any two of the following : 8×2=16

- (a) Prove that Spearman's rank correlation coefficient is given by

$$1 - \frac{6 \sum d^2 i}{n^3 - n}$$

where d_i denotes the difference between the ranks of the i th individual.

Also, mention three advantages of Spearman's rank correlation over Karl Pearson's correlation coefficient. 5+3=8

- (b) What are regression lines? In a partially destroyed laboratory record of an analysis of correlation data, the following results only are legible :

Variance of $X = 9$

Regression equations :

$$8X - 10Y + 66 = 0$$

$$40X - 18Y = 214$$

What are (i) the mean values of X and Y ,
(ii) the correlation coefficient between X and Y and (iii) the standard deviation of Y ?

2+1+3+2=8

- (c) Explain the concept of multiple correlation. Show that the multiple

correlation coefficient, $R_{1.23}$ in usual notation is given by

$$R_{1.23}^2 = 1 - \frac{\omega}{\omega_{11}} \quad 8$$

8. (a) Explain the meaning of independence of two attributes A and B and give a criterion for their independence. If

$$\delta = (AB) - \frac{(A)(B)}{N}$$

prove that

$$\delta = \frac{(B)(b)}{N} \left\{ \frac{(AB)}{(A)} - \frac{(Ab)}{(b)} \right\}$$

$$\delta = \frac{(A)(a)}{N} \left\{ \frac{(AB)}{(A)} - \frac{(aB)}{(a)} \right\}$$

where a and b represent characteristics of the absence of A and B respectively.

$$2+2+5=9$$

Or

- (b) Define Yule's coefficient of association. Explain the properties of Yule's coefficient of association.

Calculate the coefficient of association between intelligence in father and son from the following data : $2+3+4=9$

Intelligent fathers with intelligent sons = 248

Intelligent fathers with dull sons = 81

Dull fathers with intelligent sons = 29

Dull fathers with dull sons = 579

(Old Course)

Full Marks : 80

Pass Marks : 32

1. State True or False :

1×8=8

- (a) Classification is applicable in case of quantitative and qualitative characters.
- (b) Pictograms are known as non-dimensional diagrams.
- (c) Arithmetic mean is most affected by extreme values.
- (d) If for a distribution, coefficient of kurtosis $\gamma > 0$, the frequency curve is leptokurtic.
- (e) Scatter diagram of the variate values (X, Y) gives the idea about functional relationship.
- (f) Simple correlation coefficient measures the linear relationship between two variables.
- (g) The range of multiple correlation coefficient R is 0 to ∞ .
- (h) If for two attributes A and B , the class frequency $(ab) = 0$, then Q is equal to -1 .

2. Answer the following in brief : 4×4=16

- (a) What are the objectives of classification and tabulation?
- (b) Explain the graphic method of locating the values of mode.
- (c) What is meant by skewness? What purpose is served by measuring skewness?
- (d) Define regression coefficient. At what point, the two lines of regression intersect? Explain.

3. Answer any *two* of the following : 7×2=14

- (a) Differentiate between primary data and secondary data. What are different methods of collecting primary data?
- (b) Describe various measurement scales used in measuring statistical data. Explain each of them with examples.
- (c) What are diagrams and graphs? Mention four different types of diagram and four different types of graph used for presenting statistical data.

4. Answer any *three* of the following : $5 \times 3 = 15$

(a) What are different mathematical averages of a central tendency? Write down the formula of each of them for grouped data.

(b) Distinguish between absolute and relative measures of dispersion. Also mention various measures of absolute and relative measures of dispersion.

(c) Define raw moments and central moments. Obtain the relation between the central moments of order r in terms of the raw moments.

(d) What is meant by kurtosis? The fourth moment about mean of a frequency distribution is 48. What must be the value of its standard deviation in order that the distribution be (i) leptokurtic, (ii) mesokurtic and (iii) platykurtic?

5. Answer any *three* of the following : $6 \times 3 = 18$

(a) Define Karl Pearson's coefficient of correlation. Prove that Karl Pearson's correlation coefficient is independent of change of origin and scale.

- (b) A sample of 10 fathers and their sons gave the following paired data. In the parentheses the first value denotes the heights of fathers while the second value denotes the heights of sons both are in inches :

(62, 67), (63, 64), (67, 70), (71, 69),
(64, 65), (70, 66), (65, 68), (69, 71),
(68, 62), (66, 63).

Find the two lines of regression.
Calculate the correlation coefficient.

- (c) Explain why there are two lines of regression in case of two variables. Derive the equation of regression line of Y on X.
- (d) In the usual notations, prove that

$$R_{1.23}^2 = \frac{r_{12}^2 + r_{13}^2 - r_{12}r_{13}r_{23}}{1 - r_{23}^2}$$

6. (a) What are the conditions for consistency of data for three attributes A, B and C? In an experiment, an immunization of cattle from tuberculosis, the following results were obtained :

	<u>Died/affected</u>	<u>Unaffected</u>
Inoculated :	12	26
Not inoculated :	16	6

Examine the effect of vaccination in controlling susceptibility to tuberculosis. 9

Or

- (b) What is association of attributes? What are various methods of finding whether two attributes are associated or not? Discuss each of them.

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